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ABSTRACT

A study was done to examine the reasons for the low number of women in collegiate aviation education by focusing on the number and status of women aviation educators and on attitudes toward women in aviation. Information was sought from each of the 67 four-year University Aviation Association member institutions, with a response rate of 63%. Structured telephone interviews with 47 aviation program directors and aviation collegiate educators at the 42 responding institutions were conducted. The instrument requested data concerning the present status of women in collegiate aviation education and used open-ended questions to allow respondents to recommend changes. Analysis revealed that women hold 10.5 percent of the full-time aviation faculty positions, that women hold 8.8 percent of the earned doctorates in the technologically related field of engineering, and that 5.2 percent of Certified Flight Instructors are women. Responses from the 13 female interviewees indicated that the majority of them became involved in the profession by accident. Several respondents indicated that mentoring is important in a woman's career. Suggestions to women interested in collegiate aviation education included: networking, joining professional organizations, participating in conferences, acquiring higher degrees in education, acquiring as many flight ratings as possible, becoming more aggressive, seeking leadership from women, and being a role model for other women. (Includes a copy of the instrument, a list of participating institutions, information on the researcher, and a 125-item bibliography. (JB)

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NIAR Report 93-14

Maximizing Participation of Women in Collegiate Aviation Education

Jacqueline R. Luedtke

1993

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Maximizing Participation of Women in Collegiate Aviation Education

Jacqueline R. Luedtke

July 1993

NIAR
National Institute for Aviation Research

The Wichita State University
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MAXIMIZING PARTICIPATION OF WOMEN IN COLLEGIATE AVIATION EDUCATION

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MAXIMIZING PARTICIPATION OF WOMEN IN COLLEGIATE AVIATION EDUCATION

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CHAPTER I

INTRODUCTION

Background of the Study

Since the first "manned" flight on December 17, 1903, the arena of flight has almost exclusively consisted of men pilots and, consequently, men aviation educators. Even today, women constitute a very small percentage of the flying realm, including the educational field of aviation. A thorough review of literature is necessary to ascertain the scope of women in aviation education.

There has been little written on contemporary American women in aviation. Likewise, documentation of the pioneering efforts of male pilots is much easier to find than female contributions. As Holden discovered, the reasons why consist of attitude and economics. These factors still operate to a certain extent today (Holden, 1992).

The history of women in aviation epitomizes significant contributions too numerous to detail within the scope of this study. However, if women had been fully admitted into the field of aviation, the achievements they could have realized are especially apparent among the ranks of pilots and those who educate pilots. For women in aviation throughout the world, the pioneer spirit remains strong. The words of the famous aviatrix Jacqueline Cochran take on added significance since they were written almost forty years ago:

> Earthbound souls know only that underside of the atmosphere in which they live. . . but go higher up--above the dust and water vapor--and the sky turns dark and, up high enough, one can see the stars at noon. I have. (Cochran, 1954, p. 59).

Federal Aviation Administration Administrator James Busey, speaking at the Women in Aviation Conference held in St. Louis in the Spring of 1991, expressed chagrin that so few women are actively vying for opportunities in aviation--even though as he says, the door is "wide open." Busey cited statistics that demonstrate women account for only two percent of pilots flying for major airlines, eight percent of aerospace engineers, 14 percent of aviation electronics technicians, two percent of air carrier safety inspectors, and 17 percent of aviation manufacturing safety inspectors. He stated that we are "good at encouraging men, but not very good at doing the same thing for women" (Busey, 1991). Busey stated that it is time for a change. If the United States is to modernize and expand its air transport system, then it is essential that we recruit and hire more trained and talented women in the years ahead.

The opportunity to become a professional aviator has never been more accessible than now. The General Aviation Task Force reports that flight instruction increased 12.5 percent in 1989. Student pilot starts in September, 1989 were 10,153 compared to 7,624 the preceding year (More Student Pilots, 1990). The influx may be attributed to the widespread news that more than one-half of all airline captains will reach mandatory retirement age before the year 2000. Combine this with the fact that military pilot attrition rates have slowed to record lows and, thus, the career potential becomes obvious. The aviation industry today needs highly-educated personnel in order to remain competitive in today's world.

Nature of the Problem

Although women are making strides in all aspects of aviation, women in collegiate aviation education are still underrepresented at present. The small number of women in collegiate aviation education needs to be addressed. Women have been involved in "aviation education" since the inception of flight; however, higher education in aviation is a relative newcomer and it has been basically man's domain. In order for the United States to succeed in this ever-increasing technical field, higher education must continuously increase its function in producing highly-educated personnel for the aviation/aerospace industry. These highly-educated workers must include the best of the best--whether female or male.

This is an important issue for the academic department, as well as for the university as a whole. The pool of talent for new scientists and engineers is predominantly female, minority, or disabled; these are the very segments of our population we have not attracted to science and engineering careers in the past (Changing America, 1989). The role of women, along with minorities and people with disabilities, in science and engineering has been seen only as an equity issue rather than as the key to future national strength in science and technology. By the year 2010, there may be a shortage of as many as 560,000 science and engineering professionals. This threatens America's economic strength, security, and quality of life. (Changing America, 1988). Because of this predicted shortage of aviation educators and engineers, some schools are beginning to recruit more female and minorities in their aviation, aerospace, and engineering departments. For example, Purdue's Engineering School's support program for women has helped raise the proportion of female engineering students from two to 21 percent. Purdue retains women engineering students at the same rate as men (Changing America, 1988). In addition, Purdue, along with Michigan Technological University and the University of Dayton, started a career-awareness program for women in the early 70s and it continues to do well today. This has increased their enrollment of women in engineering above the national rate of 16%. This program is a one-week, concentrated career awareness program which utilizes university, industry, and governmental resources to broaden and accelerate the career awareness of tenth, eleventh, and twelfth grade high school female students and provides first-hand exposure to the academic and work environment of the engineer and engineering technologist (Shaw, et. al, 1991). As stated above, these programs have been very successful in increasing enrollment of women in engineering at these schools. Other schools with aviation, aerospace, and engineering departments need to follow these schools' examples if they are to remain competitive in the future.

It is estimated that 25 percent of the positions in traditionally male-dominated professions such as law and medicine are currently held by women. Of the 1225 women flying for the airlines in the United States today, at least 275 are captains. However, with half the population in the U.S. being female, the number of pilots is still small (5% of all airline pilots). By the year 2000, one estimate states that about 15% of the pilots flying commercial airliners will be women (Holden, 1992).

Recent studies reveal the demographics of the makeup of gender in academic departments and aviation fields. Women comprise only 5.91 percent of all FAA certificated pilots (U.S. Civil Airmen Statistics, 1991); this demonstrates that they are as a group underrepresented in aviation in relation to their proportion in society. Therefore, the concern presented for the underrepresentation of women in the aviation faculty of higher education is overshadowed by concern for the underrepresentation of women in all aspects of aviation (Bowen, 1990). Because the existing statistics provide evidence that the ratio of women in the collegiate aviation faculty is comparable to the number of women FAA certificate holders, the resulting solution must be to increase the number of overall women FAA certificate holders.

Our society has made some progress in accepting women in the work place. Strides of women are visible in many careers. However, encouragement for women to participate in aviation and aerospace education has not paralleled these successes. Recent studies have shown that women are underrepresented in the areas of aerospace engineering and aviation in general, as well as in the academic ranks (Bowen & Mathis, 1991).

The University Aviation Association (UAA) is an organization composed of colleges and universities that offer aviation educational programs. This organization, active since 1950, provides information exchange and fellowship among those involved in higher education aviation curriculum. A survey of this organization's membership will afford contact names for this study. At the present time, UAA member institutions with 4-year aviation education degree programs number 67 ("UAA membership List," 1993). This research endeavor will also provide demographic data regarding the number of students enrolled in aviation education programs, projected increase in student enrollments, number of female and male FAA certificated pilots, and faculty demographics.

Statement of the Problem

Underrepresentation of women in aviation is generally agreed to be analogous with that of other careers which have been nontraditional for women. Defining the problem of underrepresentation is certainly as complex as determining the solution. The analysis of the data to be presented may foster a greater understanding which may lead to a solution to some aspect of this problem.

The problem to be examined in this study may be stated specifically as follows: Are women underrepresented in collegiate aviation education and, if so, how can participation of women in higher education aviation programs be maximized? Do changes need to be made to allow and encourage women to choose aviation education as their field in our colleges and universities? The data which will be collected and analyzed in this study will be used to attempt to answer these questions. This dissertation will study the number of women educators in collegiate aviation at present day and determine the percentage of these women faculty versus the percentage of women in other nontraditional occupations in order to ascertain if and why women are underrepresented in this field. This research endeavor will analyze data on women faculty in collegiate aviation education to determine the level of participation of women in this academic field. The study offers recommendations of what the academic department can and should do to encourage higher participation of women in this field of aviation education.

Purpose of the Study

The purpose of this study is to collect and analyze information which can be used to examine the reasons for the seemingly low number of women in the United States' collegiate aviation educational system. With ever-increasing global competition, it is vital to assist all qualified persons in the aviation field to succeed in their chosen area of this profession. Only by utilizing all trained persons, men *and* women, will the United States remain competitive in aviation. With women comprising such a large percentage of the workforce, it is only logical to employ the best and brightest of both genders to accomplish this goal. Data will be collected directly from program directors and/or aviation faculty at each participating member institution in the UAA with a four-year degree program in aviation. These directors and faculty members can offer insight into whether or not women are, in fact, underrepresented in higher aviation education, and, if so, what they believe can be done to rectify this situation. They will be able to evaluate the status of aviation education and what the future needs might be. This research endeavor will attempt to determine what progress has been made in recent years to increase the percentage of women in collegiate aviation education. Both factual data and perceptions from the respondents will be acquired. By analyzing the history of women aviation educators, this study hopes to offer means of maximizing participation of women in collegiate aviation education.

Recommendations for improvements which will allow the integration of women more readily into this field will be sought. The information gathered through this study will allow persons in higher aviation education at all colleges and universities and at the University Aviation Association to better understand the role women should be playing in this field. Such information will also be useful to the aviation industry at large as women become a larger force in this area of study and expertise.

The current participation of women in collegiate aviation education needs to be determined before any insight towards women's effectiveness or future prospects can be gained. The collection of this data will allow recommendations to be made on how women can become an even more useful and vital force in this field in the future. The data collected through this study will allow tentative conclusions to be made about methods in which to optimize women's status and function in collegiate aviation education.

Statistics and conclusions from this investigation should be of interest to member institutions of the University Aviation Association and the aviation community at large. Research objectives are:

(1) to ascertain the number of full-time female collegiate aviation educators versus full-time male collegiate aviation educators in four-year baccalaureate UAA-member institutions at the present time;

(2) to determine the current status of women faculty in collegiate aviation education;

(3) to discern the aviation program directors' perspectives on women's representation and participation in collegiate aviation education;

(4) to discern both female and male faculty members' perspectives on women's representation and participation in collegiate aviation education; and

(5) to assess the opinions, views, and recommendations of program directors and aviation faculty for increasing the participation of women in collegiate aviation education.

Limitations of the Study

This study has been developed to collect data on the status of the participation of women in collegiate aviation education as viewed by the aviation program directors and aviation faculty of UAA-member colleges and universities. The collection of data from these directors and aviation faculty permits an opportunity to summarize the representation of women in collegiate aviation education. Presumptions of the representation of women in higher aviation education will not be made by the researcher. Any evaluations of women's representation in this field will be the perceptions of the program aviation directors and/or aviation faculty.

The material presented here is of a narrow focus to the overall problem of underrepresentation of women in aviation. This undertaking will be successful if it yields some progression in the awareness of this problem and, accordingly, addresses even one aspect of its resolution. This study will be limited to data accumulated from aviation program directors and aviation faculty at University Aviation Association member-institutions that have four-year-degree programs in aviation education. Such data may be subject to error and biases of the subjects of the interview. The survey is limited to telephone interviews due to the number and distances of the institutions involved. Because telephone interviews will be utilized, body language cannot be observed which, at times, can be as important as the answers themselves. However, telephone interviews decrease the probability of "socially desirable responses" whereby the respondent says what he/she thinks the interviewer wants to hear. Bias on the part of the researcher is a possibility since the researcher is a female doctoral candidate in higher aviation education. However, this will be minimized by employing research assistants to conduct the actual survey: a female assistant will survey all female respondents in anticipation that they will be more open with their answers if addressing another female. A male research assistant will survey the majority of the male respondents for the same reason; however, the female assistant will survey a small percentage of the male respondents. Other general and demographic objective data are presented and described in a manner which will, hopefully, allow for the understanding of the subjective information presented by the interviewees.

Further limitations include:

(1) only perceptions and opinions of aviation program directors and aviation faculty will be included,

(2) the inability to visit campuses to witness aviation programs in operation, and

(3) extended evaluations which are not possible within the time constraints.

Assumptions

The following assumptions were conceded:

(1) the assumption that aviation program directors and aviation faculty were candid in their responses,

(2) the assumption that the questionnaire covered the necessary topics,

(3) the assumption that the questionnaire was properly worded for easy understanding, and

(4) the assumption that persons interviewed accurately represent the nature of aviation education.

Definitions

The following terms and abbreviations will be used in this study. Definitions are therefore provided.

A&P.	Airframe and Powerplant Mechanic
ATP.	Airline Transport Pilot
Aviation Education.	Non-Engineering Aviation Education
Aviatrix.	A woman pilot
AWS.	Airway Science
CAA.	Council on Aviation Accreditation
CFI.	Certified Flight Instructor
DOT.	Department of Transportation
FAA.	Federal Aviation Administration
FAI.	Federation Aeronautique Internationale
FE.	Flight Engineer
NAA.	National Aeronautics Association
NASA.	National Aeronautics & Space Administration

UAA.	University Aviation Association
WACs.	Women's Army Corps.
WAFS.	Women's Auxiliary Ferry Squadron
WFTD.	Women's Flying Training Detachment
WASP.	Women's Airforce Service Pilots

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

This analysis will study demographics regarding women aviation pilots/ educators since 1903 to present day in order to ascertain the past participation of women in all aspects of the aviation field. This review of women in aviation in general is necessary to establish the interest and participation of women throughout aviation history. Other areas of literature that will be used include data on women entering male-dominated fields such as engineering, medicine, law, etc. Comparisons of how women enter these male-dominated fields versus aviation will be made. Sources to be utilized in this literature review will include but are not limited to "Proceedings of Women in Aviation" conferences, Educational Resources Information Center, Dissertation Abstracts International, Info Track, Dialog and affiliates, and On-Line Computer Library Center.

Since the early days of aviation, women have been active participants in aviation and aviation education. Opportunities for women in aviation did not come easily. They were based on decades of struggle, determination, and perseverance. One of the most famous figures in aviation history is Amelia Earhart. She won early acclaim by becoming the first woman to fly across the

Atlantic in 1928; however, her success was marred by the fact that two male pilots had actually been at the controls throughout the flight, even though she was a qualified pilot. Earhart compensated for this by achieving many record-breaking flights and she eventually flew solo across the Atlantic in May, 1932. She was lost at sea while attempting to fly around the world in 1937 (Gyr, 1990).

A year later, another woman pilot, Lores Bonney, flew solo from Brisbane, Australia, to London--about five times as far as Earhart's trip across the Atlantic. Because she was not trying for a speed record and she did not have as good a publicist as Earhart, her flight was unacclaimed and forgotten over time. There was little notice taken of her remarkable feat; this may have been because of the culture of the day and people believed a woman's place was "in the home" (Gyr, 1990).

Women like Amelia Earhart and Jacqueline Cochran were highly visible and continually earned kudos and criticism, but most women in early aviation posed an economic threat to the men. Any failure was used to prove they were physically and emotionally unfit for flying. Ironically, if they survived an accident, it was used to show that air travel was safe (Holden, 1992).

Background Literature

Women have been active in aviation and aviation education since the beginning of flight. Katharine Wright, sister of Orville and Wilbur, helped finance "man's" first flight. Katharine contributed to their scientific pool of knowledge and to their bank account through their struggle to conquer flight. Almost every historian credits her with using the money she earned teaching Latin and Greek to purchase the materials for their fragile airplanes (Holden, 1992).

Ever since that infamous day, women have also been caught up in the "spirit" of flight; unfortunately, few women had the economic means or society's approval of furthering their interest in this area. Influential persons in aviation were aware of women's efforts and accomplishments and could have helped to expand the roles of women in aviation, but they were surprisingly restrictive in their views. For example, Eddie Rickenbacker took the executives of Boeing to task in 1930 for hiring the first female flight attendants. He argued that flying was a man's occupation and should stay that way (Holden, 1992). However, the women that persevered thought it important to educate the non-flying public about aviation. From that date to present time, women have been involved in aviation education in a variety ways--and today, women are making inroads into the higher education of aviation in our colleges and universities. The following is a brief history of the involvement of women in aviation and aviation education from 1903 to present time.

1903-1918

Orville Wright rejected all female applicants on the grounds they were notoriety seekers. An early rival of the Wright Brothers, Glenn Curtiss, had to be coaxed to accept a female flight student. However, he then "fixed" the airplane so it would not obtain enough power to fly and restricted his student, Blanche Stuart Scott, to ground school classes and taxi tests. Scott persevered, however, and in 1910, with the help of a mechanic on the field, she became the first American woman to solo an airplane (Baty, 1990).

American women were not alone in their battle against men for the right to fly. In 1911, Germany's first woman aviatrix, Melli Beese, discovered that her male colleagues had tampered with her plane's steering mechanism and had drained gas from the fuel tank. When questioned why, one of the men replied that "for a woman to fly would take the glory away from us" (Baty, 1990).

On July 24, 1912, Katherine Stinson became the fourth and youngest (age 16) woman in U.S. to earn a pilot's license. In May, 1915, at 17, her sister, Marjorie became the first woman authorized to fly the experimental airmail service; it was unofficial and little mention is found in history books. The Post Office did not restart airmail service until 1918. The Stinson sisters started a flying school in San Antonio, Texas; they taught their brothers, Eddie and Jack, to fly. Eddie, first a test pilot, later founded the Stinson Aircraft Co (Holden, 1992).

Because men controlled the economy and the money, they dominated the new sport of flying. Elitism soon prevailed and women were considered not physically fit to become pilots. This, however, did not discourage all women from learning to fly; even movie actresses got into the act. The majority of women who entered the aviation arena did so for the thrill, for the fun of flying.

However, women who desired a career in aviation were very serious about educating the public about the safety and efficiency of flight (Brooks-Pazmany, 1991).

1919-1929

Many who entered aviation in the 1920s were drawn by the romance and excitement of flying, only to find out that there was far more hard work than time for fun. For most pilots, commercial aviation was a tenuous way to make a living. As the novelty wore off, many returned to their former, more traditional lifestyles (Brooks-Pazmany, 1991).

The challenges that confronted women pilots in the 1920s are faced by all women entering a field that is generally considered a masculine domain. Despite the odds against them, women of that era made great contributions to the development of aviation. From the beginning, women have been an integral part of aviation's progress. The attitude that flying was socially inappropriate and even physically impossible for women was common. To overcome the prejudice, women took to the skies first as passengers before assuming a more visible role as pilots, thereby demonstrating the relative ease and safety of air travel.

By World War I, 11 women had earned their pilot's licenses and countless others were flying without one. Although the U.S. government refused to allow them to fly in combat, women put their flying skills to use during the war--by making fund-raising flights for the Red Cross and Liberty Loans and by lending their names to the recruiting effort ("Those magnificent women," 1985). By the end of the decade, women pilots had helped to bring the airplane before the public as a practical mode of transportation and a wonderful new form of recreation.

When civilian flying was curtailed during WWI in the United States, women pilots found diverse ways to stay active in aviation. They took jobs such as aeronautical draftsmen for the U.S. Navy Department, expeditors for the British Air Ministry, etc. After the war, when flying was again open to civilians, there was great competition for aviation-related jobs. For women, barnstorming was often the only means of access to a career in aviation. Many times, they began as wing walkers and parachutists. Some formed flying troupes, flying schools, engaged in demonstration flying and other aviation-related businesses--anything in order to stay in the aviation field (Brooks-Pazmany, 1991).

One of the problems a woman had to face on the barnstorming circuit was lonesomeness. Other problems included public opinion and political pressure; both of these had a great impact on the success or failure of a woman's aerial career. After any accident involving a woman, there was usually a public outcry to restrict women from the flying arena.

During the years after WWI, women had a considerable influence in changing flying from a novelty to a lucrative commercial industry. Anytime a woman boarded an airplane, it made news. Both the industry and individuals were quick to capitalize on the press's eagerness to publicize the women in aviation. Taking an airplane flight or buying a plane was a sure way to put a Hollywood starlet's name in bold print. Women also attracted attention for personal causes through air travel (Brooks-Pazmany, 1991).

Recognizing the persuasive value of women seen using their products, manufacturers featured them in advertisements from everything from goggles to oil to parachutes. Manufacturers also sought endorsements of the aircraft women pilots flew. These endorsements often evolved into full-time paying positions as demonstrators or sales representatives (Brooks-Pazmany, 1991).

Realizing the power of the written word, women wrote about aviation, lauding the delights of flying and arguing the case for women's right to fly. Many female journalists used the press as a medium to promote airmindedness and the development of commercial aviation. Other women were zealous supporters of American aviation; they lobbied in Congress for the cause of women in aviation (Brooks-Pazmany, 1991).

Between the wars, women continued to make inroads in aviation. Bessie Coleman, the world's first black licensed pilot, overcame both sexual and racial barriers. Because she could not persuade anyone in the United States to teach her to fly, she traveled to France in order to take flying lessons. She returned to the U.S. with her Federation Aeronautique Internationale (FAI) license (Brooks-Pazmany, 1991).

Most women who flew were only interested in flying for recreation; however, there were numerous women who viewed aviation as a new, uncharted field. It was not unusual for a woman to go into business for herself, including flight instruction, carrying passengers for hire, operating airfields across the country, etc. However, in these enterprises, women did not attract much national attention. To gain national prominence and make a name for herself, a woman needed to set and break speed, distance, and altitude records. Because the FAI/NAA (National Aeronautics Association) had no separate category for women, their first efforts went unrecorded and unacknowledged by this regulatory body (Brooks-Pazmany, 1991).

As the ranks of women pilots slowly grew, they became a force in many areas of aviation, including air racing and setting and breaking world records. In 1929, women were allowed to compete in a national aviation event--the National Women's Air Derby. This was a chance for women to prove they were competent, professional pilots. Although women had been in many aspects of flying (exhibition, sport, transport, sales, and record setting), one area remained to be tackled--racing. Racing was the most dramatic and visible way for pilots to demonstrate their abilities. The 1929 National Women's Air Derby brought women pilots together from all across the country and a new organization was born--the "Ninety-Nines." Its first president was Amelia Earhart. By competing in this Derby, the women pilots had provided the industry with another forum through which to test state-of-the-art aircraft ("Those magnificent women," 1985).

Women pilots in the 1920s were dedicated to establishing their credibility. These pilots were a significant force for the progress of aviation. They were among the most daring of barnstormers. They strove to promote flying as a safe and convenient way to travel. They tested and demonstrated new planes; they carried passengers and gave flying lessons; they set new records, they raced, they established a category for women's records, they founded their own pilot's organization. By their active participation, women helped aviation come of age in America. Their contributions helped to bring aviation into its present place as a vital industry in modern society (Brooks-Pazmany, 1991).

1930-1939

The 1930s marked a positive change for aviation and women. Amelia Earhart defined for the decade what women were trying to prove by their flying: flying is safe and women make good pilots. Women wrote articles and gave speeches on the safety, convenience, and luxury of air travel. They worked, along with men, as promoters and participants in the fast-paced new field of aviation. There were approximately 200 licensed women pilots in the United States in 1930. By 1935, that number had grown to between 700 and 800 (Oakes, 1991).

Women entered the highly competitive spheres of air racing and commercial air travel. Leading women pilots took part in the development of commercial air travel. They also began to compete with men in major air races. In 1936, just one year after women were allowed to enter the transcontinental Bendix Race, women took both first and second place honors ("Those magnificent women," 1985). During this decade, women were also hired to fly on commercial flights as stewardesses. On May 15, 1930, the first group of eight stewardesses began service from Chicago in a Boeing 80A transport, westbound on a 20-hour, 13-stop route to San Francisco. A *few* of the stewardesses' jobs included demonstrating to people that flying was safe, serving passengers, assisting in refueling the aircraft, transferring baggage, mopping the cabin floors, and checking bolts to ensure that all seats were securely fastened to the floor (Oakes, 1991).

Many women were involved in the furthering of aviation safety and visibility. Unfortunately, the history books generally do not relate these women's stories to any degree. Nonetheless, women made significant inroads during the infancy of aviation. They found various ways of making money in order to fly; some became barnstormers, stunt pilots, wing walkers, acrobatics. Women became instructors, they worked with the federal government in various aspects of aviation, they became spokespersons for various aircraft manufacturers, they founded flying organizations for mercy missions, they participated in races. The most oft heard aviatrix was, of course, Amelia Earhart. Amelia had many accomplishments; in addition to flying solo across the Atlantic, she was the first person to fly solo from Hawaii to the U.S. mainland in January, 1935. Before her disappearance during her around-the-world attempt, Earhart actively promoted aviation as an industry and acted as a role model for thousands of young women ("Those magnificent women," 1985). She was also active in aviation research and served as an advisor in aeronautics at Purdue University (Samuelson, 1984).

Another famous woman pilot was Jacqueline Cochran; she set numerous altitude and speed records by 1939, after only five years of flying. Her total career record in aviation has never been equalled by *any* other pilot. Cochran wanted to form a women's Air Corps Auxiliary at the start of WWII; however, this fell on deaf ears. There was no way women would be allowed to fly for the military during that time in history (Those magnificent women," 1985).

Helen Richey was the first woman hired as co-pilot on the Pennsylvania Air Lines in 1935. However, bitter objections by male pilots forced the airline to fire her even though she had more experience than other men applying for the job. Activities such as barnstorming, wing walking, flying circuses, and parachute jumping allowed women to use entertainment and showmanship to attract crowds, earn money, and keep flying. However, the bias against women as serious aviators may have increased as they became more and more a part of recreational and stunt flying (Lea, 1990).

One of the barriers to women who wanted to fly was money. Only one out of seven American women worked outside the home; their average income was $850 a year. In addition to this financial barrier, there was a more basic feeling of fear which held women back. Society taught most women not to be courageous; women were supposed to rely on men for protection and provision (House, 1990).

Early women in aviation were glamorized by the media; most, however, achieved their reputations through hard work, determination, and successful competition. Unfortunately, these traits were seen as "unladylike." Flying was still considered a male pursuit, and women who took it up either for recreation or as a career were often labeled "tomboys." It was "unnatural;" women pilots were not "keeping their place." Women in aviation threatened the comfortable illusions about their "limited capabilities" (Lea, 1990).

Most of the early female aviators, aware that their very presence in planes was crossing gender barriers, flew in long skirts and feminine hats, even though the unpressurized airplanes were extremely cold. In contrast, Amelia Earhart wore comfortable, old flying clothes. When it was cold, she wore a heavy flying suit just like male pilots. Interestingly, this outfit made Earhart immediately recognized as a pilot and obeyed by ground crews. Again, this was seen as "unladylike;" instead of viewing her as a female Charles Lindbergh, some of her critics thought her attire suggested that she was Lindbergh in drag. Perceiving Earhart as a male transvestite was easier for some people than having to consider the implications of a woman soloing across the Atlantic (Jay, 1991).

Starting in the 20s and 30s, the aviation industry sought to convert public attitudes about flying and safety through advertisements featuring women (Lea, 1990). In the 1930s, women became involved in selling aircraft instruments, contacting prospective buyers, demonstrating aircraft performance, giving talks on aviation, picking up new airplanes at the factories, charter flying, instructing, running their own charter services, helping to popularize air mail. Women pilots established an "Air Marking Program," whereby each state took part in a program to better identify its towns and cities from the air (Oakes, 1991).

According to Louise Thaden, a prominent and respected woman pilot of the day, aviation in the 1930s was the "first time women began to be accepted on their own merits as pilots. It was time of growth and exploration, when all 'firsts' were *really* firsts" (Oakes, 1991, p. 11).

By the end of the 1930s, there were several prominent female aeronautical engineers. Women were being encouraged to educate themselves for engineering and executive positions in order to fill vacancies on aircraft assembly lines when and if American men had to go overseas (Oakes, 1991).

1940-1945

By the outbreak of World War II, much had changed for aviation and women pilots. Air travel was a much more commonplace mode of transportation. Manufacturers and aircraft sales companies no longer felt the need to continue hiring women as demonstration pilots and saleswomen because most of the novelty and the fear was gone from private flying. Since the glamour and excitement of the air races had dimmed, women could no longer count on winning races as a means to making names for themselves in aviation (Oakes, 1991).

By making aviation tamer and more acceptable, women had, ironically, closed career doors they had previously followed toward fame in aviation. Women were being taken more seriously as good, professional pilots. But at the same time, they had worked themselves out of the limelight and, in many cases, out of a job. Women pilots were no longer a novelty. This was not to say there was smooth sailing for women in aviation, but, for the most part, women had accomplished their goals of helping make air travel a standard means of transportation and had proven to the world that women could be competent pilots (Oakes, 1991).

The early women of aviation sought to educate the public about the safety of aviation and to promote the aviation industry. They did this in a variety of ways, from speaking engagements to writing to flying itself. Although women have not been as visible in the collegiate environment as men, they have been involved in aviation education in many diverse ways. Socialites, starlets, deaf women, recreational and serious aviatrixes all helped to define the world of aviation for America, as well as for the world. Although they were not part of the collegiate world, their presence was felt throughout the industry.

There were many "firsts" during the years of World War II. Everyone recognizes the contributions of "Rosie the Riveter" during the war whereby women stepped in to take over jobs of men in the aircraft plants when men went off to war. After the war, of course, the women were supposed to give up their jobs and return home as full-time housewives and mothers. There were many more contributions women made during this time in the area of aviation--ontributions that were never publicized in any great detail. Although women trained as civilian and military pilots since WWI, in 1940, Helen Richey was the first woman to be licensed by the newly-formed Civil Aeronautics Authority. The WACs--Women's Army Corps--took over jobs from men who could perform Army combat duties, e.g., women worked as aircraft mechanics, parachute riggers, welders, instrument technicians, electricians, aerial photographers, radio technicians, radio-control tower operators, weather observers, etc. The WAVES--Women Accepted for Volunteer Emergency Service--were involved with jobs for the Navy. The "Army Nurse Corps" transported women closest to the front lines; they provided air-evacuation service (May, 1962). In 1941, Jacqueline Cochran copiloted an Air Force bomber to England. In September, 1942, Stephen's College in Columbia, Missouri, became the first school to offer women a course in aviation (Smith, 1981).

The flyers of the Women Airforce Service Pilots (WASP) of WWII were pioneers, the first licensed women pilots in the U.S. to fly military airplanes for a military service. The WASP was formed in August, 1943, from two earlier, relatively independent programs for women pilots: the Women's Auxiliary Ferrying Squadron (WAFS), an experimental squadron of experienced women pilots employed to ferry aircraft for the Air Transport Command, and the Women's Flying Training Detachment (WFTD), a training program established to supply pilots for the squadron. Thirty-eight women Airforce Service Pilots lost their lives flying for their country in the Army Air Force during WWII. On

December 20, 1944, the WASP program was deactivated. The WASPs' lives as military pilots abruptly ended and they returned to civilian life with no veterans' benefits (Noggle, 1990).

Jackie Cochran's "girls" of the WASP made a revolutionary statement about the physical and mental capabilities of women--even if the government would keep the information buried in classified files for thirty years. WASP had proven that bright, healthy American girls could learn to fly the army way just like their brothers (Verges, 1991).

Ruth Woods, one of the WASPs who continued flying long after the end of the program, thought the women of the WASPs ". . .opened the door for the present women in the Air Force and other women in aviation. We opened that door so that they would be accepted and not sneered at. We laid the groundwork. We followed behind people like Amelia Earhart, who were loners. We came in as a body, a group--any group can exert a lot more pressure than a single individual. I personally feel that was our greatest accomplishment" (Cole, 1992, p.136).

In 1977, the government finally approved a "WASP" amendment to the G.I. Bill Improvement Act of 1977, which granted the WASP full military status and made them eligible for veterans' benefits--32 years after they had been deactivated and sentenced to obscurity (Verges, 1991).

In 1943, the first women were trained as air traffic controllers for the Civil Aviation Administration due to a shortage of men. After the war, they were replaced by men, and it was not until several decades afterward that women were again admitted to the control tower (Smith, 1981).

1945-1965

From their unselfish efforts (with the war effort, etc.), women earned genuine but distant respect from some men. Women pilots were viewed as being either a small and strange minority or as trouble-makers trying to upset the status quo. Hidden behind almost every objection voiced by men was this last fear. An upset in the male aviation community would have grave economic and social consequences; women would steal jobs and gain power (Holden, 1992).

About 25,000 women worked in the aircraft industry during WWII. After the war, all forward motion for women in the direction of progress came to a stop. Women were directed to return to their homes and husbands, freeing up jobs for returning male veterans. But there had been progress (Holden, 1992).

In 1953, Jacqueline Cochran became the first woman to break the sound barrier. The "Whirly-Girls" started in 1955; this is an international organization of women helicopter pilots that provides a support network for women who fly helicopters. In August, 1991, there were 781 Whirly-Girls from 26 countries (Holden, 1992).

1965-1980

In 1966, Ensign Gale Ann Gordon became the first woman to solo in a Navy training plane. In 1970, the first women were admitted to U.S. Air Force Officers Training School and, in 1973, the first class of eight women began pilot training with the U.S. Navy. Also in 1973, Emily Warner, as copilot with Frontier Airlines, became the first American woman in modern times to fly for a scheduled airline. In 1976, women were admitted to U.S. Air Force Academy and to the U.S. Navy Aviation Officer Candidate school at Pensacola, Florida (Smith, 1981).

Space Program

The space race began October 4, 1957, when the Soviet Union launched the first man-made satellite, Sputnik I, into space. From the women's point of view, the race was won by the Russians on June 16, 1963, when Valentina Tereshkova became the first woman in space. It would take fifteen years before the United States even considered choosing women to enter space. However, in 1960, Jerrie Cobb became the first woman to pass the tests for being an astronaut. She was so successful in passing the tests, twenty-four other woman were solicited to suffer through the same examinations. In spite of outstanding results, these women were never utilized as astronauts; in fact, almost two decades passed before women were considered more seriously for the space program (Hodgman, 1981).

By 1976, scattered studies indicated that women "appear equal to men for space flight," and increasing evidence pointed to the conclusion that women may be more suitable than men for some missions. The tests on women in the 1960s by NASA had drawn correct conclusions--women were equal and in some cases better equipped to handle space flight than men (Holden, 1992).

In January, 1978, NASA selected thirty-five astronaut candidates for its space shuttle program; six were women: Dr. Shannon Lucid, a biochemist; Dr. Anna Fisher, a physician; Dr. Judith Resnik, an electrical engineer; Sally Ride, a physics research assistant; Dr. Margaret Rhea Seddon, a surgical resident; and Kathryn Sullivan, a doctoral candidate in geology. All six women were picked to be mission specialists, which means that although they would not pilot the shuttle, they would take part in medical, engineering, scientific duties, and space walking (Hodgman, 1981).

It was June 18, 1983, when Dr. Sally K. Ride became America's first woman astronaut to make it into space. Ride became a model for women to look up to when she became an astronaut. In October, 1984, Kathryn Sullivan became the first American woman to space walk. Anna Fisher was the first mother to fly in space in November, 1984. Christa McAuliffe, chosen to be the first teacher in space, symbolized the chance that ordinary people, not just Ph.D.s or pilots, could go into space. Mae Jemison, who joined NASA in 1987, was the first black female astronaut (Briggs, 1988).

According to Briggs, both the Soviets and the Americans have discovered a benefit to including women astronauts in their space programs. They contend that the whole work atmosphere and mood in a crew of men and women are better than in men-only environments. "Somehow, the women elevate relationships in a small team, and this helps to stimulate its capacity for work" (Briggs, 1988, p. 23). Every group of astronauts chosen since 1977 has included women and there is no reason to expect this to change. Whether one is female or male is no longer important to NASA.

1981-1993

By 1983, the number of women flying for the airlines had grown to just over 200, and by 1992, that number had grown to 1200 women flying for American commercial airlines and about 600 military pilots (Holden, 1992).

Not all women associated with jets are interested in flying them. Olive Ann Beech of Waverly, Kansas, does not pilot her own plane, yet she is one the best known women in aviation today. She was president of Beech Aircraft Corporation; she became president in 1950 when Walter H. Beech died. Under her leadership, Beech Aircraft has formed a corporation that carries on research on secret projects, especially those related to missile development. Beech Aircraft has also pioneered development of small jets to serve as traveling planes for military personnel (May, 1962).

The Ninety-Nines have become an impressive organization in furthering women's commercial interests in aviation. It serves as a network and inspiration for women to write articles on aviation and fosters a sense of air-mindedness. The Ninety-Nines address civic clubs, schools, and governmental institutions, taking their knowledge and love of aviation to the community-at-large.

Today, the Ninety-Nines number more than 7000 members in nine countries. In 1979, when the Ninety-Nines celebrated their Golden Jubilee, Air Force General (and Senator) Barry Goldwater hailed, ". . .the great accomplishments of women pilots throughout the last half century, particularly the lasting contribution they made to the development of aerospace pursuits." His words were proof of what Amelia Earhart had said fifty years earlier, "If enough of us keep trying, we'll get someplace" (Holden, 1992, p. 53).

There are increasingly open avenues for women seeking careers in aviation today. These include careers as cargo pilots, aviation inspectors, corporate pilots, air traffic controllers, aeronautical engineers, boom operators, flight engineers, and astronauts (Smith, 1981).

Nowadays, Navy women routinely fly the mail to aircraft carriers and deliver food and weapons to ships all over the world. They dogfight, test new missile systems, and serve as flight instructors. Women flight students are now a common sight in Pensacola. In 1990, there were 12,477 Navy pilots, 225 of whom were women (Holden, 1992).

In general, service policies are more restrictive than the laws themselves. While it is possible for women to attain equal opportunity, these laws and policies prevent them from acquiring the necessary experience to compete for the high level operational commands that are the pinnacle of a military career. It is impossible for a woman to even remotely qualify for the top job in the Navy--Chief of Naval Operations. Women have a better shot at becoming Secretary of the Navy. According to some women Navy pilots, "No matter her ability, the determining factor in a military career is still her sex. There can be no such thing as equal opportunity until the combat laws are removed." (Holden, 1992, p. 115). However, Anna Fisher, astronaut, reported that she found less discrimination as an astronaut at NASA than she found in the medical profession (Hodgman, 1981). On April 28, 1993, the Department of Defense announced that the ban on women combat pilots was lifted ("Women in combat," 1993). It will be interesting to see what, if any, effect this will have on women's opportunities in the military and in aviation, in general.

Comparisons Between Other Male-dominated Fields versus Aviation

Because aviation and aviation-related fields have traditionally been male-dominated arenas, it is useful to compare how women have fared in aviation versus other male-dominated fields such as business, medicine, law, and engineering. How well have women cracked the "ole boy" network in these areas and how does this compare to aviation? There has been quite a bit of research completed in this area recently and articles were analyzed from a wide range of journals, from Education and Urban Society to Frontiers in Education, Psychology of Women Quarterly, American Scholar, Journal of Business Ethics, Law & Society Review, Administrative Science Quarterly, Women & Therapy, Psychological Reports, Management Quarterly, Human Relations, and Harvard Business Review. Some of the pertinent ideas from this research are addressed below.

Walk into almost any established law firm and you will still find, as you would have found a generation ago, that the majority of partners are white males from a middle- or upper-middle-class background. Women are there, but they have not been promoted proportionately with males (Spire, 1990).

In the 1970s, the increases in the numbers of women law students accounted for virtually all of the increases in the numbers of law students. The influx of women into the law profession has been attributed to the women's movement, increasing availability of higher education, and variations in the availability of traditional women's jobs. The enormous increase of women in the legal profession occurred at a time in which the profession itself was growing at a tremendous rate. Yet the culture of these firms, which is still dominated by men, does not yet treat women as equal to men (Hagan, J., Zatz, M., Arnold, B., & Kay, F., 1991). In 1984, only five percent of partnerships in law firms were held by women. Women lawyers are still not making it to the centers of power, money, and prestige (Hewlett, 1986).

In all environments--industry or collegiate--to a large degree, women are still perceived as being less committed to their jobs or careers, especially if they are mothers. These entrenched attitudes have prevented women from moving up the corporate ladder.

A "good manager" is described mostly in masculine terms, that is, people continue to adhere to the male managerial stereotype and perceive successful managers as having characteristics and attitudes typically ascribed to men. Indeed, women who wish to move up the corporate ladder have been advised to adapt more masculine characteristics so as to be more "acceptable" in organizations.

Contradictory results about gender bias may be due to differences in the attitudes of male and female employees. However, female employees' attitudes towards female managers are becoming more positive, i.e., women judged female managers to be more intelligent, likeable, and successful than male managers (Leventhal & Garcia, 1991).

Men and women have different management styles; for example, women get people to work by inspiring them and involving them in decisions. Some researchers state that "this makes women seem indecisive or unwilling to assert themselves" (Garland, 1991). However, according to others, this may constitute the "Female Advantage," that is, with their superior management instincts, women "may be the new Japanese." The traits that were once labeled women's weaknesses and cited as reasons that they were ill-suited for top jobs are suddenly the very characteristics male executives are expected to wear on their sleeves (Fierman, 1990).

The socialization of males is more akin to management training than that of females. Adults, including parents, respond differently to male and female children, contributing to their different developmental experiences; this has implications for future behavior.

The assumption of leadership roles by women is further complicated by the lack of peer support and of mentors or models functioning in similar roles or assuming equivalent responsibilities. Women leaders must cope with their own and others' resistance to their assumption of attitudes and behaviors necessary for effective leadership and face conflict generated by contradictory self-perceptions and expectations.

The factors that are most frequently cited as influential upon women's career choice include education and training experiences, mentors and role models, and family and personal influence (Nadelson, 1989). Attitudes of husbands and encouragement by teachers, nonparental family members, and significant males influence women's career attitudes (Bridges & Bower, 1985). Inflation, divorce, greater opportunities, boredom with housewifery, political consciousness, not marrying or not having children, and changes in what they want out of life have all played a part in women's careers (Tangri & Jenkins, 1986).

Women have been expected to clone the male competitive model in the labor market while raising children in their spare time--a double burden. By age forty, 90 percent of all women have had children, but among professional women (who constitute fewer than 10 percent of all working women), the story is different. Surveys of lawyers, business executives, and other professionals show that less than half the career women of the 1960s and 1970s have had children (Hewlett, 1986).

Recent studies show that American men still do less than a quarter of all household tasks and that married men's average time in family work has increased by only six percent in twenty years despite the massive shift of women into paid employment. One survey finds that the work week of American women is still twenty-one hours longer than that of men. Working women are still stuck with most domestic chores, and this severely limits how well they perform in the labor market. "Men's characteristically low level of family work is one of the key problems of contemporary life" (Hewlett, 1986, p. 89).

Male-type jobs cover a wide range of prestige levels; female-type jobs tend to be clustered at the low end of the prestige continuum and pay lower wages than male jobs (Bridges & Bower, 1985). When women supervise other women in a managerial category, the job turns into a "woman's job;" such jobs lose their power and result in "female managerial ghettos" (Grondin, 1990).

Given inadequate (or no) maternity leave and the paucity and expense of child-care facilities, the majority of working women are forced to make drastic compromises in their work lives. Some leave the labor force for a number of years; others take third-rate jobs. When they resume the all-out commitment necessary for career advance (usually around the age of forty), the structure of the labor market makes it extremely difficult, if not impossible, for them to get back on track (Hewlett, 1986).

Public policies that support women in their efforts to bear and rear children would go a long way toward narrowing the wage gap. And once the gap between male and female earnings narrows significantly, equal sharing of housework and child rearing between men and women will await the day when a woman's job is as important to the household economy as a man's. Unless women get some relief from their domestic responsibilities, they will continue to fare badly in the labor force (Hewlett, 1986).

Carolyn Jagacinski examined and compared the differing background and career characteristics of men and women engineers. She found that the parents of women engineers were more likely to have college degrees and to be employed in professional positions and that women engineers were less likely to be married and were more likely to be childless than were men engineers. Although men and women reported comparable levels of technical responsibility in their present jobs, gender differences favoring men were found for supervisory responsibility and salary among those with more than five years of experience, with the gap between men and women increasing with experience. It was also established that women engineers are not receiving the same career advancement opportunities as men. Although industry has become more willing to hire women engineers, they are not promoted to the same supervisory levels as men (Jagacinski, 1987).

Women constitute less than one-fourth of college and university faculty members across all disciplines and professional areas and are concentrated in the lower ranks in nonladdered, untenured positions, working primarily in traditional women's fields with predominantly female students. Women are conspicuously absent from the power structure in administration and are barely represented as deans, presidents, and chancellors (Nadelson, 1989).

The picture is similar in fields outside of academia. Less than 16 percent of state legislators, 12 percent of mayors, 10 percent of judges, five percent of the U.S House of Representatives, and two percent of the Senate are women. Barely five percent of middle management and one percent of top management are women. Some of this may be because younger women have not yet accumulated the experience necessary for leadership positions or that they are not interested because of family responsibilities. That these reasons are questionable is attested to by data indicating that, despite their commitment and hard work, women continue to rise more slowly in organizational structures than men of comparable qualifications (Nadelson, 1989).

Only seven percent of employed women in America work in managerial positions, and only 10 percent earn more than $20,000 a year. Three-quarters of American working women continue to be employed in traditional "women's jobs" and spend their time waiting on tables, typing letters, cutting hair, emptying bedpans, and cleaning offices. Most are badly paid. In 1984, 1 out of every 4 women earned less than $10,000 a year when working full time (Hewlett, 1986).

Today 45 percent of working women are single, divorced, separated, or widowed and have no option but to take prime economic responsibility for themselves (and often their children). The low earning power of women helps explain why 35 percent of single mothers fall below the poverty line.

The wage gap in America is extremely wide and has not shifted in fifty years. In 1939, women earned sixty-three cents to a man's dollar; today women earn sixty-four cents to a man's dollar. There is a revolving door for women at the bottom of the managerial career ladder; women are segregated into a pink-collar ghetto of low-paying jobs (Hewlett, 1986).

Possible Solutions Suggested in the Literature:

Companies are trying different alternatives to attract and retain female executives; they are doing this because it makes good business sense. Because some men will never feel comfortable letting women into the club, companies have found that they must implement formal policies and procedures to force increased hiring and retaining of women executives. Some of the recommendations include (1) formal mentoring programs; (2) tying part of an executive's bonus to his or her progress in promoting women and minorities, a policy that has led to a 25% rise in the numbers hired; (3) sponsor national conferences for women; (4) develop network opportunities for women; (5) provide technical and programmatic assistance; (6) establish a central source of research, information, and resource materials about women in engineering and related areas; (7) disseminate information nationally through conferences and publications; and (8) increase the availability of financial grants for female students in higher education and use additional incentive grants to attract students into areas of projected faculty demand (Bjork & Thompson, 1989).

One of the suggested solutions is the development of mentoring programs. Mentors may serve to provide for the protege's upward mobility in the organization by providing support, visibility, resources, and direction. These are significant factors in career development.

Positive correlations between mentoring relationships and self-reports of career success have been found among women in medical, legal, and academic professions. Because female managers are frequently the sole female in an all-male environment, they may face increased stereotyping, visibility, performance pressures, and isolation. Additionally, women in such positions may face "status leveling" in that they may be stereotyped and misidentified as lower status, clerical workers. This serves to decrease the female manager's ability to assert her authority and legitimacy within an organization (Ragins, 1989).

Mentoring relationships, while important for men, may be essential for women. The mentoring function of promoting upward mobility is particularly crucial in the case of the female manager. Compared to their male counterparts, female managers face greater organizational, interpersonal, and individual barriers to advancement. Mentors may serve to buffer the female manager from both overt and covert forms of discrimination and may help their female protegees circumvent structural, social, and cultural barriers to advancement in the organization (Ragins, 1989).

Mentors may also train female protegees in the "ins and outs" of corporate politics, provide the female manager with "inside" information on job openings and changes in the organization's technology, structure, and strategy. This is especially crucial since women tend to be excluded from such "ole boy" networks. Mentors may also help female managers develop an effective and accepted managerial style. Mentors are perceived as being instrumental in helping women overcome gender-related obstacles to advancement in organizations.

One reason why women may be less likely than men to seek mentors is that they may fail to recognize the importance of gaining a sponsor and may naively assume that competence is the only requisite for advancement in the organization (Grondin, 1990).

Female managers may also have fewer formal and informal opportunities to obtain mentors than their male counterparts; for example, they lack access to informal settings frequented by potential male mentors, e.g., men's rooms and golf courses. Another problem is that male mentors may be unwilling to select female protegees. They may not even consider female managers as candidates for protege roles. Sex-role socialization may condition male mentors to view women as mothers and spouses (Grondin, 1990).

Given the time constraints and the potential overload of requests, female executives may be less willing or available for mentoring roles than male executives. Women face greater obstacles to advancement and, consequentially, may have to spend more time performing their jobs and advancing their careers. Thus, there are two primary problems with women mentors--the shortage of potential female mentors and the lack of time available for them to serve as mentors. The primary disadvantage with female mentors is that they tend to be less powerful than male mentors--therefore, they will be less able to promote the careers of their female protegees (Grondin, 1990).

Compared to their male counterparts, women apparently face more barriers and constraints to developing and maintaining effective mentoring relationships. The gamesmanship and competition involved in research are historically unfamiliar to women. Given the need for information, some of which the new researcher does not know enough to inquire about, it is problematic when it is not volunteered by more experienced colleagues (Nadelson, 1989).

Organizations may choose to either address or ignore this problem. By ignoring it, organizations may lose valuable managerial talent. There are four steps organizations can take to encourage the mentoring process: (1) provide opportunities for female managers to interact with potential mentors in both formal and informal settings; (2) provide training for proteges and mentors; (3) cultivate more female mentors at lower levels of the organization; and (4) institutionalize the mentoring relationship as part of the performance appraisal and employee development systems.

Special programs have been instituted at the National Science Foundation to encourage women researchers, and all the agencies are aware of the need to increase the pool of women scientists. Purdue University, funded by the National Science Foundation, has established innovative programs for women in Engineering and expanded the scope of existing programs (Weertman, 1990).

Literature Establishing the Problem

One of the primary objectives of this report is to analyze the potential similarity between the number of women pilots and the number of women faculty in UAA colleges and universities which offer a baccalaureate degree in aviation. Secondarily, data obtained on the number of women faculty in aviation will be analyzed against data on the number of women receiving earned doctorates.

Secondary data were obtained from two sources. Data on the number of women who are pilots was obtained from the FAA which publishes an annual summary of pilot demographics titled U.S. Civil Airmen Statistics. The data on women receiving doctoral degrees is periodically collected by the U.S. Department of Education. This information is reported annually in The Chronicle of Higher Education Almanac. These sources can be regularly reviewed to monitor the progress toward achieving proportional representation for women in both of these areas.

Analysis of the change in the percentage of women pilots from 1981 to 1991 may offer a brief historical perspective. Data from the U.S. Civil Airmen Statistics displayed in Table 1 compares the ratios of female to male FAA pilot certificate holders from 1981 to 1991.

TABLE 1

TOTAL FAA CERTIFICATED PILOTS

	1981			1991	
	Certificates Held	Percent		Certificates Held	Percent
Female	47,721	6.24	Female	40,931	5.91
Male	716,461	93.76	Male	651,164	94.09
Total	764,182	100.00	Total	692,095	100.00

Source: U.S. Civil Airmen Statistics, FAA, 1981 and 1991.

While the last ten years have seen advances in opportunities available to women, progress has not been evidenced in piloting careers. Data from the U.S. Civil Airmen Statistics in Table 2 on page 48 provides a detailed distribution of women FAA certificate holders. Both non-flight and flight categories are presented. A comparison between the current data and that from ten years previous is displayed.

TABLE 2

FEMALE FAA CERTIFICATE HOLDERS

Category	1981	1991
Student	22,591	14,501
Private	19,602	17,514
Commercial	4,101	5,652
ATP	584	2,308
FE	189	1,256
CFI	2,165	3,629
A&P	1,051	3,901

Source: U.S. Civil Airmen Statistics, 1981 and 1991.

Although percentages of certificated women pilots are widely disproportionate, higher education is one area where women are experiencing gains toward achieving a proportionate role to men. Table 3 reveals the current gender distribution in the higher education faculty according to the 1992 Chronicle of Higher Education Almanac.

TABLE 3

FACULTY DISTRIBUTION BY GENDER

Gender	Percent	Number
Female (100%)	27.3	133,497

TABLE 3 (Continued)

Male (100%)	72.7	355,503
Total (100%)	100.0	489,000

Source: The Chronicle of Higher Education Almanac 1992

Most fields within higher education are experiencing gains in the number of women who are receiving doctoral degrees. Within the discipline of education, this figure has surpassed 50 percent; however, in engineering, the percentage is only 8.8 percent (Chronicle of Higher Education, 1992). In-as-much as there are no doctoral degrees solely devoted to aviation aside from aerospace engineering, Table 4 on page 50 utilizes data from the Chronicle of Higher Education to illustrate the number of women receiving doctoral degrees in business, education, and engineering. Business and engineering degrees are important because they reflect the closest degrees to aviation-related fields in most institutions. As can be seen from Table 4, women in aviation-related degree areas (business and especially engineering) are not making as much progress as much as women with education degrees.

TABLE 4

PERCENTAGE OF WOMEN RECEIVING DOCTORATES
1990

Field	Percent
Business	24.4
Education	57.7
Engineering	8.8
Median All Fields	36.3

Source: The Chronicle of Higher Education, 1992

A review of the information obtained in Table 2 on page 48 suggests a view of limited success in the professional categories. The limitation is that as the proportion of women who have become Airline Transport Pilots (ATP) has increased from 584 in 1981 to 2,308 in 1991, the number of women student pilots has decreased from 22,591 to 14,501 during this same time span. These figures indicate that the years of 1981 to 1991 have seen a period of attrition within the ranks along with a significant decrease in new entrants. This trend could further indicate a decrease in the total number of women pilots in forthcoming years. Although regression is evident in several areas, advances and achievements which have occurred are also noted. The progress exhibited in the notable increases made at the professional pilot level of ATP and Commercial held ratings demonstrates that new inroads are being achieved by women in aviation. Table 2 further illustrates other accomplishments made during the last ten years.

The demographic data viewed in Table 3 on page 48 discloses that 27.3 percent of all higher education faculty are women. Currently, the median figure of women receiving doctoral degrees is 36.3 percent (Table 4, page 50). Since the doctoral degree represents the primary credential for higher education faculty, the increasing number of women receiving this degree throughout the remainder of this decade suggests that women will obtain a more proportionate role in the higher education faculty. This figure should provide further encouragement to women to pursue the attainment of faculty positions in higher education as well as to continue the pursuit of the doctoral degree.

An examination of graduate engineering enrollments offers some insights into the problem of increasing the numbers of women in Aerospace Engineering faculty positions. Women comprised seven percent of the graduate enrollment in aerospace engineering in 1988, compared to 12 percent for engineering overall. Of advanced degrees granted in Aerospace Engineering, 6.9 percent were granted to women versus 11.6 percent granted to women in all engineering disciplines. At the Ph.D. level, six percent of Aerospace Ph.D. degrees went to women versus 6.8 percent of Ph.D. degrees in all engineering fields (Changing America, 1988). These statistics do not offer promise of any immediate increases in the representation of women in Aerospace Engineering faculties. Even if one-half of all women obtaining Ph.D.s in Aerospace Engineering choose to pursue academic positions, the available numbers would not permit any great percentage increases of women in faculty positions.

What this means to academic departments and to universities as a whole is that they need to actively cultivate their disciplines of aviation management/ aerospace engineering research. They must understand that women, along with minorities and the disabled, are the groups that will constitute a high percentage in these areas of study and they need to strongly recruit these groups. Historically, Aviation Management has been an interdisciplinary discipline and, thus, has had a hard time finding a home in any particular department. For example, at one institution, Aviation Management might be housed in the Business Department, while elsewhere it is located in Engineering or Education. No one really knows where it should be situated; it usually depends on which chairperson is a champion of aviation research/education. In order to maintain the growth of this field of study, it is important that aviation education/management find a home in a department that will nourish it so that it can find its true niche. In time, with sustained growth, aviation might emerge as an academic department itself in more and more universities.

Related Research

In 1988, women comprised 51 percent of the population and 45 percent of the nation's workforce, yet they constituted only 11 percent of all employed scientists and engineers. Although the number of women and minorities in science and engineering increased through the early 1980s, the absolute numbers were small and are now declining. Federal employment has not kept pace with the increase in women scientists and engineers emerging from our education system. In 1987, only 10 percent of the Ph.D.s employed were women, although women earned 17 percent of the Ph.D.s awarded in science and engineering. The declining enrollment of U.S. graduate students is masked by recent high enrollments of foreign students in these fields, especially engineering. As of 1988, 75 percent of graduate students receiving financial support from university engineering departments were foreign nationals. The cultural attitudes of foreign students, particularly if they are instructors, may discourage some Americans, especially women, from taking science and engineering courses (Changing America, 1988).

A task force was established in 1988 to examine the current status of women, minorities, and the handicapped in science and engineering positions and to develop long-range plans to advance opportunities for these people in our society. The task force's recommendations are important for universities to understand and to implement. Interest in science and aviation increased during the high points of the United States' space program. We need to be aware of this increased interest and act on it.

The Task Force on Women, Minorities, and the Handicapped found that, although women enter graduate school at about the same rate as men, they are considerably less likely than men to obtain a Ph.D. (Changing America, 1988).

These trends among the traditionally underrepresented groups cannot continue. Strong leadership from presidents, deans, and department heads with a vision to the future is needed. The departments in these areas must increase their underrepresented faculty members in order to change with the times and attract the traditionally underrepresented students.

Searches through the literature of all popular sources have resulted in little summary information about the representation of women in collegiate aviation education. Inadequacies in popular literature may be attributed to the lack of professional educational journals in the field of aviation. They can also be attributed to the small size of aviation education in comparison to other collegiate educational programs.

The insights and conclusions of this study will add useful information to the body of understanding not only on the future of women in collegiate aviation education but also how this translates into the future of collegiate-trained professional aviation managers and practitioners.

CHAPTER III

METHODOLOGY

Preliminary Procedures

Data were collected to determine the present status of participation of women in collegiate aviation education. This information was requested from the designated aviation directors and/or aviation faculty members of UAA member organizations (N= 67). A questionnaire was utilized to gather data from UAA-member institutions with four-year degree-granting aviation programs in order to: (1) ascertain the number of full-time female collegiate aviation educators versus full-time male collegiate aviation educators; (2) determine the current status of women faculty in collegiate aviation education; (3) discern the aviation program directors' perspectives on women's representation and participation in collegiate aviation education; (4) discern both female and male faculty members' perspectives on women's representation and participation in collegiate aviation education; and (5) assess the opinions, views, and recommendations of program directors and aviation faculty for increasing the participation of women in collegiate aviation education.

Structured telephone interviews with aviation program directors and aviation collegiate educators were conducted, utilizing the aforementioned questionnaire.

The results of this survey were analyzed in order to make recommendations regarding how to maximize participation of women in collegiate aviation education. A copy of the interview questionnaire is found in Appendix A.

This survey instrument requested data concerning the present status of women in collegiate aviation education and utilized several open-ended questions to allow an opportunity for respondents to recommend needed changes. It also collected summational data on the representation of women in this field, which allowed an overall understanding of women's effect in aviation and aviation education in our colleges and universities. The questionnaire consisted of 27 questions regarding the status of aviation education in colleges and universities and the current status of women in each institution. Chapter 4 details the questions utilized on the survey. Statistics compiled by the U.S. Department of Transportation/Federal Aviation Administration served as one basis to develop the direction of inquiry for the survey instrument (U.S. Civil Airmen Statistics, 1991). Reports released by the University Aviation Association and The Chronicle of Higher Education provided other resources to identify potential concerns which should be addressed.

Operational Procedures

Because of the small size of the group participating in the study, measures were taken to attempt to obtain a higher than normal response rate. To accomplish this,, the survey was conducted through a structured telephone interview technique. Utilizing a structured telephone interview technique allowed participants to provide more complete open-ended responses to highly subjective questions. This technique also insured a higher response rate than the use of a mailed questionnaire. Participants in this study were assured confidentiality. Multiple efforts were made to contact aviation directors and aviation faculty at each UAA college or university with a 4-year aviation-degree program. A minimum of three calls was attempted with each institution during the latter half of February and the first half of March, 1993. Unsuccessful contacts resulted when person(s) being called were either unavailable or unwilling to participate in the survey. If the contact person(s) were not available after at least three attempts, that institution was withdrawn from the pool.

The interview questionnaire evolved through a multi-step development and validation procedure. Step one involved presenting the first draft of the questionnaire to the researcher's doctoral committee for evaluation. The second step was to gain input from a representative of the University Aviation Association regarding the content of the questionnaire. The third step in this procedure involved presenting the refined document to an expert in telephone surveys at the Wichita State University. Step four was to gather input regarding the questionnaire from an expert in the field of English and Grammar at Wichita State University. After integrating these experts' suggestions and recommendations, the questionnaire was ready to test, utilizing a pilot study group (step 5). The pilot group was utilized to determine practicality and to identify communication problems with the questionnaire.

The pilot study group was selected outside of the survey response group because of the small number of UAA-member institutions. This was to insure that all possible participants were available for the study rather than compromised through the pilot. A sample equal to five percent of the survey group was selected for the pilot study group. These institutions consisted of aviation colleges and universities which offer four-year aviation programs but are not members of the University Aviation Association. This pilot group was geographically dispersed to represent the geographically-dispersed survey group. Changes were then made to the questionnaire to resolve any vague questions or communication problems identified through this pilot study group.

The revised draft of the questionnaire was then presented to the researcher's committee for final approval prior to beginning the survey (step 6). This completed the validation and development process for the interview instrument.

Research Design and Analysis

The data of this research endeavor were displayed in a descriptive format. Findings included demographic data, institutional data, combined summation of objective responses, and a summation of subjective responses given on the questionnaire. Results were reported in a summational, descriptive manner because confidentiality was assured to all participants. This assurance to participants was needed to secure honest and complete responses to the questions. The summational data were then used to form a basis for conclusions and recommendations concerning the representation of women in collegiate aviation education.

CHAPTER IV

FINDINGS AND DISCUSSION

Introduction

The purpose of this chapter is to present the data which were obtained through the interviews of aviation directors, chairs, and female and male aviation collegiate educators. These findings were analyzed to find out why women are not well represented in the aviation field and how institutions can increase the number of women faculty in collegiate aviation education. The sequencing of the presentation of findings was designed to afford a concise and comprehensive report of all data which were collected.

One of the goals of this research was to collect constructive opinions and perceptions about the representation of women faculty in collegiate aviation education and how to maximize the participation of said women collegiate educators. Discovery of the needs and opinions of aviation directors, chairs, and faculty could add insight into how the institutions can best maximize the representation of women faculty in higher aviation education.

Primary data on women faculty in collegiate aviation programs were obtained through a survey of current UAA-member institutions that offer a baccalaureate degree in aviation education. Each of the 67 UAA institutions which listed some sort of baccalaureate-degree program in aviation was contacted (UAA Membership List, 1993) and requested to report the number of full-time aviation faculty, distinguishing the total number of males and the total number of females, the highest degrees and flight ratings held by each full-time female faculty member, etc.

The goal of this chapter is to present the data collected through this study which will yield tentative conclusions and recommendations on how to increase and maximize women faculty's participation in collegiate aviation education. Both subjective and objective data were collected through a structured telephone interview (see Appendix A). The interview questionnaire utilized a series of open-ended questions which allowed the participants the opportunity to discuss their assessments of the representation and participation of women in higher aviation education. Further explanation of the procedures was provided in Chapter 3.

Survey respondents included the aviation director, chair, and/or female and male faculty members at each of the 67 UAA institutions with 4-year aviation management/education programs. Multiple attempts were made to reach these persons at each institution. A list of the 67 UAA-member institutions at the time this study was initiated is found in Appendix B.

Demographic Data

In addition to the primary opinion data, demographic data were aggregated to provide a basis of descriptive information which would increase the ability of the reader to understand the environment from which data were collected.

The interview instrument contained 11 demographic questions which were utilized to provide a basis for understanding the variety of institutions in the response group. Table 5 describes the gender distribution of aviation faculty of the 42 responding universities of this survey. Of the total 47 interviewees, 13 were women including four women program coordinators.

TABLE 5

GENDER DISTRIBUTION OF
AVIATION FACULTY

Gender	Number	Percentage
Female	25	10.5%
Male	212	89.5%
Total	237	100.0%

Student enrollments in aviation education majors at responding institutions ranged from 12 to 1060 with a mean of 263.7. Table 6 on page 63 indicates the total number of aviation education students of the responding 42 institutions enrolled in each degree area (AS, BS/BA, Masters, Doctorate) during the Spring, 1993, semester. Only eight of the 42 responding institutions plan to offer a higher level aviation degree within the next two years in addition to what is presently being offered; seven will be offering a masters degree and one will be offering a doctorate in aviation education. The percentage of female students in these aviation-degree programs ranged from five to 50%, with the average being around 14% of the total students in aviation. Twenty-one institutions incorporated a minor in aviation in their curriculum, while 21 universities did not include an aviation minor in their program.

TABLE 6

NUMBER OF STUDENTS IN 4-YEAR DEGREE AVIATION EDUCATION PROGRAMS

AS	705
BS/BA	10,149
MS/MBA	195
Doctorate	5
Total	11,054

Thirty-two institutions characterized their aviation programs as growing, three indicated their programs as declining, and seven believed their programs would stay fairly constant in the near future. Growth projections ranged from slow (2%) to explosive (200%). Only one responding institution reported that an administrative cap had been placed on enrollment so that their program was not allowed to grow at the present time. Table 7 indicates the projected growth of the 32 institutions that are forecasting increased enrollments in their aviation programs in the near future.

TABLE 7

PROJECTED INCREASE IN ENROLLMENTS IN NEAR FUTURE

Expected Growth Reported	Frequency
200%	1
100	2
75	2
50	1
40	1
30	1
25	2
20	4
15	3
10	5
5	7
Rapid	2
Slow	1

Table 8 displays the number of highest degrees and ratings held by the full-time women aviation faculty employed at the 42 responding universities. Of the 33 institutions that indicated they employed Certified Flight Instructors, 350 (86%) were men and 57 (14%) were women. Likewise, of the 36 institutions indicating they utilized Certified Ground Instructors, 192 (86%) were men and 31 (14%) were women. Of the 25 colleges and universities that offered aviation scholarships, 112 were available for men or women, with five scholarships being available for women only.

TABLE 8

HIGHEST DEGREES/RATINGS OF FEMALE FACULTY
IN 42 INSTITUTIONS

Degree	Frequency	Rating	Frequency	Rating	Frequency
Bachelors	6	Private	2	CFII	2
Masters	7	Instrument	1	GI	1
Doctorate	9	Commercial	1	A&P	1
		ATP	5	MI	1
		CFI	3	MEI	1

Perhaps the most significant finding is the fact that the majority of the colleges and universities projected notable growth for their aviation programs in the future. This is especially surprising in today's troubled economic times. However, it has been demonstrated that slow or difficult economic periods are an opportune time for students to stay in or return to school to complete their degrees.

Findings

The response group consisted of 42 of the 67 institutions, with 47 people responding at these 42 institutions, for a 63 percent rate of participation. This 63 percent response rate represented a wide diversity of colleges and universities. Both objective and subjective information were collected from the 47 interviewees. This data collection process was considered successful because it exceeded the response rate of 55% which would be considered a representative percentage by research authorities (Perry, 1988).

The instrument utilized to gather data was comprehensive and required a generous time investment of up to thirty minutes (with the average being 20 minutes) on the part of the respondents. A series of yes/no and scaled-rating items was utilized in order to examine the subjective opinions of the aviation directors, chairs, and faculty members. Some of the questions allowed for a "why" or "why not" follow-up. The follow-ups which received a reply are reported in narrative form following the tables of the yes/no and scaled responses. Table 9 on page 67 provides a listing of the yes/no questions and the totals for each.

TABLE 9

YES/NO QUESTION RESPONSES

Question	Yes	No	Don't Know	Maybe
Do you have a minor in an aviation discipline?	21	21	0	0
Do you feel women faculty and/or students are underrepresented in collegiate aviation education?	39	6	2	0
Will you be hiring any new faculty in the next two years?	26	12	0	7

Table 10 lists the responses to the questions which asked the respondents to rate their opinions of a particular item on a scale of 1 to 7, with 1 being Strongly Disagree and 7 being Strongly Agree.

TABLE 10

RATING RESPONSE

Strongly Agree 7 6 5 4 3 2 1 Strongly Disagree

Question	Average Response 7 Pt. Scale
The fact that 6% of U.S. certified pilots are female is a satisfactory number.	2.3

TABLE 10 (Continued)

In order to attract and retain female students in nontraditional professions, universities should provide child care.	3.7
The FAA promotes the participation of females in collegiate aviation education.	4.3
The University Aviation Association promotes the participation of females in collegiate aviation education.	5.3
The FAA's Airway Science Program assists in recruiting female aviation students.	3.8
There are barriers to female faculty in aviation education in general.	3.2

Significant findings also resulted from the use of open-ended and follow-up explanation questions. These items provided the opportunity for the respondents to qualify many of their yes/no and scaled-rating responses.

Thirty-nine respondents indicated they believed that women faculty or students are underrepresented in collegiate aviation education; their reactions suggested that reasons for this probably include: the "good ole boy" network keeps women out of the field, a lack of role models for women, women do not see aviation as a viable career for themselves, it is a struggle for women to be accepted in a nontraditional field, women do not know the opportunities available in aviation, and there is a shortage of qualified or available females. This indicates that, although women have made inroads in collegiate aviation, there is a ways to go, especially concerning people's perceptions. One respondent stated he felt that the rewards are stronger in industry versus education and that this also contributed to the underrepresentation of women in collegiate aviation education.

The majority of respondents felt it was unsatisfactory that only six percent of U.S. certified pilots are female. A few remarked that this number might be small as a result of the responsibilities of raising children, because of industry norms, or due to a lack of interest. The response regarding child care provisions in order to attract and retain female students in nontraditional professions resulted in a middle-of-the-road rating of a 3.74. However, this question prompted the most diverse replies compared with the other scaled questions; that is, people who were in favor of this were definitely in favor of it and those who were opposed were vehemently opposed.

People were neutral when assessing whether the FAA assists female participation in collegiate aviation education or if the FAA's Airway Science Program aids in recruiting female aviation students. However, some of the comments indicated that the respondents do not believe the FAA is doing as much as they should and is primarily just giving "lip service" in promoting females in aviation education. The majority of respondents indicated that they thought the UAA is doing a pretty good job in assisting the participation of females in collegiate aviation education. The one question that was perhaps the most sensitive was the one pertaining to the respondents' beliefs regarding barriers to female faculty in aviation education. The majority felt that there were few barriers to women in aviation education, although female respondents indicated they believed there were more barriers than did male respondents. The respondents who did believe that barriers exist thought it was because of the following reasons: male dominance in attitudes, the makeup of faculty (i.e., in the past, institutions have hired retired military men for their positions), attitudes toward women, the macho syndrome, women did not possess the combination of experience (ratings) and degrees needed, and the difficulty for female pilots to get enough general aviation experience for serious consideration. Both female and male respondents cited these examples. The male respondents in the southern and eastern parts of the country were more negative regarding women in aviation and in aviation education.

Discussion of Findings

Significant subjective findings include men's common, recurring perspectives of the role of women in higher education and, especially, in aviation education. According to survey respondents, the biggest obstacle to women in collegiate aviation education is the "good ole boy" network. Women must constantly break through this network of predominantly white men and their attitudes toward women--that is, women do not belong in the cockpit, they cannot do the job as well as men, etc.

Popularity of aviation programs in higher education can be identified from information displayed in Table 7 on page 64. Seventy-six percent of the institutions surveyed indicated their programs were growing and were projected to keep growing in the near future. Increased enrollment projections ranged from 200% to a minimum of 2% with one institution reporting "little growth." Only seven percent of the institutions indicated declining enrollments, while 17% stated their enrollments would probably remain constant.

The information obtained from the survey results offers two sets of descriptive data about the status of baccalaureate-level aviation programs. First, it provides a measurement of the overall size of the faculty in these programs. Secondly, the data provides the gender distribution of the aviation faculty.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This study has attempted to gain insight from collegiate men and women aviation educators to determine ways to increase and maximize participation of women in the aviation educational field. Information gathered through this study should allow aviation-education departments, their institutions, the University Aviation Association, and the Federal Aviation Administration to better understand the needs of aviation-oriented students and faculty members. Additionally, it provides knowledge to enhance women's role in collegiate aviation education, as well as the aviation programs themselves and the departments and institutions in which they are housed. Such information should also be useful to the aviation industry at large as attitudes and roles change for women and men, both in the collegiate setting and in industry. Recommendations for action on how to augment this endeavor are presented.

Summary

This research endeavor was organized around five primary research objectives. They were (1) to ascertain the number of full-time female collegiate aviation educators versus full-time male collegiate aviation educators in four-year baccalaureate UAA-member institutions at the present time; (2) to determine the current status of women faculty in collegiate aviation education; (3) to discern the aviation program directors' perspectives on women's representation and participation in collegiate aviation education; (4) to discern both female and male faculty members' perspectives on women's representation and participation in collegiate aviation education; and (5) to assess the opinions, views, and recommendations of program directors and aviation faculty for increasing the participation of women in collegiate aviation education.

The purpose of this study was to examine the contributions of women to aviation education and to analyze data on FAA certificate holders to compare it with demographic data obtained on aviation faculty to establish whether or not women are underrepresented in the collegiate aviation faculty. Women comprise 5.91 percent of all FAA certificated pilots. Women hold 10.5 percent of the full-time aviation faculty positions in UAA-member institutions with four-year aviation-degree programs (see Table 5, pg. 62). Women hold 8.8 percent of the earned doctorates in the technologically-related field of Engineering (see Table 4, pg. 50). Finally, 5.2 percent of Certified Flight Instructors are women (U.S. Civil Airmen Statistics, 1991).

These figures indicate a consistently common level of participation by women in the field of aviation. In the area of the aviation faculty, it could be stated that the participation of women is representative of the participation of women in aviation overall and that there should be no call for alarm. However, this would be a critical fallacy. It would be appropriate to state that the number of women aviation faculty members is comparable to the figures cited above. It would even be more appropriate to state that women are underrepresented in all aspects of aviation in relation to their proportion in society (Bowen, 1991).

Consequently, the concern for the underrepresentation of women in the aviation faculty of higher education is eclipsed by concern for the underrepresentation of women in all of aviation. If the data presented within this study provides evidence that the percentage of women in the aviation faculty is comparable to the number of women FAA certificate holders, then the resulting response must be to increase the number of overall women FAA certificate holders.

The relative short history of aviation education has progressed from one or two schools offering an aviation course to universities offering multitudes of courses. One has only to look today to see the profound effect aviation has on the world around us. There is no doubt that the need for aviation education will continue in the future. Deans, educators, chairpersons, and university departments must be prepared to meet the future challenges of a growing aviation industry.

Conclusions

Having discovered that only 10.5 percent of the collegiate aviation faculty consists of women, the question of why must now be considered. After reviewing

Tables 3 and 5 (pages 48 and 62), which show faculty distribution by gender, one can see that the percentage of overall faculty which are women (27.3%) is not relational to the percentage of aviation faculty which are women (10.5%). This fact demonstrates that aviation faculty are not representative of the national norm with respect to the percentage of faculty which are female.

Table 4 (page 50) exhibits data on the percentage of women receiving doctorates in aviation-related fields; the median shown (36.3%) does not correspond with the percentage of aviation faculty who are women (10.5%). However, the field of engineering has a percentage of 8.8 percent of earned doctorate recipients being female that is close to the percentage of female aviation faculty (10.5%). Since aviation is perceived to be a high technology field, it could be possible that these two figures have a relational tie. Another correlation indicated is between the percentage of women aviation faculty and the percentage of women who are pilots.' Table 1 on page 47 reveals the fact that 5.91 percent of FAA certificated pilots in 1991 were women. When you compare this with the fact that 10.5 percent of aviation faculty are women (Table 5, page 62), a correlation can be perceived. The percentages of women faculty and women pilots are very similar. This bit of data may imply that women faculty in higher education are representative of the demonstrated interest that women have in aviation. If so, it could be stated that the problem is not that women are underrepresented in the aviation faculty ranks, but the problem is that women are underrepresented in aviation as a whole.

Another figure which offers significant correlation to the percentage of women faculty and overall women pilots is the percentage of women who are Certified Flight Instructors. In 1991, the U.S. Civil Airmen Statistics reported that 5.2 percent of FAA Certified Flight Instructors were women. Being close to the women aviation faculty figure of 10.5 percent may indicate a relationship. The basis for this relationship could be reasoned through the fact that the Certified Flight Instructor rating is held by those who become pilot educators. Furthermore, the Flight Instructor certificate acts as the terminal rating for most aviation educators.

Today, colleges and universities are facing difficult times with overall shrinking student enrollments, the slow economy, and cutbacks. In addition, institutions have unique problems regarding academic credibility and accreditation policies. However, in order to regain and retain the competitive edge, it is critical that colleges and universities utilize all of the available talent. It is absolutely mandatory to employ the best and brightest minds--whether female or male. By ignoring or under-utilizing 51% of the United States' population, industry and universities alike are misusing a great natural resource.

The survey instrument employed in this research endeavor allowed some insight into the magnitude of this problem. History has shown that it has always been a struggle for women to break into a male-dominated field, and aviation has been no exception. This research has demonstrated that, just as in other nontraditional areas, women are slowly making inroads to the aviation arena. More and more research is being conducted in this area; for example, one respondent indicated that research is being done on sexual harassment in the cockpit in an effort to tear down some of the barriers to women in aviation.

Women in the field of aviation have always presented a threat to men; men feared the social and economic consequences of women in aviation. They were apprehensive that women would steal jobs and gain power. This is a concern of men even today; men do not want to have male-dominated arenas upset by women. This became apparent through responses to the survey by some retired military men and especially by men in the southern part of the country. However, responses from numerous male interviewees were encouraging because their views seem to be changing favorably regarding women in aviation and aviation education. The majority of men indicated they were in favor of more participation of women in this area; this changing attitude should aid women in advancing in this field in the future.

Even though women have been involved in aviation since its beginning, the majority of the United States' population knows very little of women's history in this area. Little, if anything, is taught in schools regarding the contributions women have made in aviation, the aviation-related jobs they took over when men went to war, and the educational advances women have championed. If attitudes are to change, girls as well as boys in the lower grades must be taught the history of women in aviation and that females can and should be involved in aviation and aviation education.

As has been shown through this research endeavor, women are underrepresented in higher education, especially in the higher, more prestigious jobs in academia. Because women are still "breaking into" higher education, it will be a slower process still in male-dominated fields such as aviation. Responses from the 13 women interviewees indicated that the majority of them became involved in the aviation profession by accident, e.g., they took flying lessons because husband/father was a pilot, someone took them for an airplane ride, etc.

Six of the 13 female respondents stated that a mentor had helped them in their career; seven had no mentor. However, when asked for suggestions for women who want to become involved in collegiate aviation education, several of these 13 indicated that mentoring is important in a woman's career. Other suggestions included networking with women and men, joining organizations such as the Ninety-Nines, participating in Women in Aviation conferences, acquiring higher degrees in education and as many flight ratings as possible, becoming more aggressive, seeking leadership from women, and being a role model for other women.

This survey demonstrated that, although attitudes are changing, the stamp of societal upbringing still has a strong hold on men, as well as on women. Women generally are raised to be polite, not to interrupt, not be aggressive, to pursue a feminine career. This upbringing handicaps women competing in a male-dominated field.

As stated in Chapter 4, one of the most significant findings in the survey is the fact that the majority of the colleges and universities anticipate notable growth for their programs in the future. This is a good sign that institutions will be hiring additional faculty in the near future--and women should comprise a higher percentage of new faculty hired.

Recommendations

Aviation/aerospace departments, as well as universities as a whole, must contemplate alternative solutions to the growing problem of underrepresentation of women in collegiate aviation education to competently meet the future. The recommendations offered here are not comprehensive toward the resolution of the problem considered herein; however, they should offer insight toward the possible alternatives and solution of this problem of underrepresentation.

Some of the same barriers that women face in any male-dominated field occurs in aviation as well. Institutions must decrease stereotypical barriers women face in aviation. They must sensitize the aviation public to the problems women encounter and investigate means to punch holes in the "good ole boy" network.

It is essential that everyone involved in aviation, whether in education, business, or government, encourage industry to hire more women in aviation. We have Equal Employment Opportunity laws, but these are not enough. Women must be hired and promoted in industry (as well as in academia) by formal methods if informal means do not work. It is critical to integrate women in all aspects of aviation in order to utilize all of our talented workforce and to stay competitive.

The bottom line seems to be that working women need more than equal treatment. In the 1970s, it was thought that all that had to be done was to outlaw discrimination; supposedly, this would automatically break down the barriers so that women could fully participate in the labor market. However, equal treatment in the workplace must be supplemented by family support systems if women are to improve their economic position (Hewlett, 1986).

The data obtained through this study offered verification of the previously developed assumption that women are not proportionally represented in the aviation career fields which require FAA certification or in the aviation faculty ranks. The fact that only 5.91 percent of all aviators are women (Table 1, page 47) necessitates a cause for immediate action. An even greater concern arises from the fact that this percentage decreased slightly during the previous ten years from 6.24 percent in 1981 to 5.91 percent in 1991. The fear is that perhaps an appreciable change in the forthcoming ten years will not be evidenced without a coordinated action plan.

Colleges and universities, as well as the UAA and FAA, must work toward encouraging and facilitating more women to become pilots. Possible means of accomplishing this is through sponsorship of women's aviation organizations and by marketing to younger female students in order to inform these potential students of the opportunities available in aviation. As demonstrated, it is important to solicit assistance from women's aviation organizations; these organizations are a wealth of information and assistance. They also provide scholarships for worthy women pilots or want-to-be pilots.

Previously addressed were reasons why women have not achieved proportional representation in aviation. One reason cited was that young women do not have an adequate number of role models. This is especially true for those women who choose to become pilots or aviation educators. Colleges and universities should recruit more women aviation faculty to foster role models. It has been proven that when universities, businesses, or NASA employ women on their staff, these women provide good role models for both students and for up-and-coming women executives and faculty alike. Institutions must increase the number of female students in their aviation programs. Likewise, they must develop more coordinated graduate programs in aviation, whether as an actual masters program in aviation education or as an emphasis in this field of study. By enlarging female student enrollments, a certain percentage will eventually infiltrate the academic ranks. Perhaps as more women enter male-dominated careers, their presence as role models for girls and women will further serve to demonstrate the appropriateness of nontraditional career choices.

Colleges and universities should utilize available talent within their institutions and structure mentor relationships with senior faculty recognized for excellence in teaching, research, publishing, and service--areas critical for new faculty in meeting tenure expectations. These efforts may reduce entry shock of new women faculty, contribute to their socialization into the professorate, improve their chances in successfully competing for tenure track appointments, and reduce the "revolving door" being experienced nowadays.

Institutions should also consider consolidating the number of part-time and adjunct faculty and create new tenure track lines designated to be filled by women and minority faculty and supported by additional institutional resources (Bjork & Thompson, 1989).

One solution to the "glass ceiling" problem might be to "degenderize" occupations by increasing the number of qualified presently-underrepresented personnel. This can be accomplished through the resolve of the heads of organizations, most of whom are men, and a deliberate attempt to train women specifically to increase the availability of competent women in different areas. Improvements should occur over time, aided by the elimination of tokenism, increased competence of applicants, and the redistribution of opportunity and power within organizations (Leventhal & Garcia, 1991).

Researchers assert that the United States must produce more professionals, especially from underrepresented groups, in order to meet the demand for faculty, industry, and Federal personnel by the year 2000. Specifically, universities should (1) lead in creating a climate of action and accountability that accelerates the participation of underrepresented groups in all aspects of their institutions; (2) set quantitative goals for recruiting, retaining, and graduating more U.S. students in aviation and sciences, including students from underrepresented groups. Departments should set similar goals and take responsibility to ensure more students from these groups attain doctorates and obtain faculty positions; (3) provide child care for families of students and faculty; (4) establish transfer centers with qualified counselors in 2-year colleges to ensure maximum flow of talent from these to 4-year institutions (Changing America, 1988).

It is evident that our society is in the midst of a paradigm shift. A paradigm is a set of beliefs or values at the core of group consensus. A paradigm shift occurs when those core values change and the group accepts the change. While the United States has women in various levels of leadership, our society as a whole has not yet made the paradigm shift necessary to allow women to compete equally with men (Nubson, 1991).

Because colleges and universities are suppose to be the forerunners in new, progressive ideas, these institutions must demonstrate that they have acknowledged this new paradigm and have wholeheartedly embraced it. The majority of participants in the survey responded that they believe it is important to address these issues in order for women to make greater inroads into the aviation education arena. With women constituting the majority of the U.S. population and becoming an ever-increasing influence in enrollments in the collegiate system, it only makes sense that the underrepresentation of women in all areas be addressed. As previously discussed, the majority of aviation directors and faculty believe this to be an important issue in higher aviation education.

For institutions that are experiencing growth in their aviation programs, the percentage of female students is comprising a larger and larger component of this growth. Thus, it is essential to understand this problem and discover the solutions that will effectively deal with it so that all persons, whether female or male, are encouraged to reach their highest potential.

As the number of women in aviation education expands, the ingrained attitudes of men and women regarding women's place in aviation will slowly change. With more and more research being conducted in this area, more people will become aware of the problem; this awareness will induce alternative solutions. As has been shown through this research endeavor, people are becoming aware of the underrepresentation of women in collegiate aviation education. This is the first step towards rectifying the situation.

The WASPS, among their repertoire of songs, had one entitled "Zoot Suits and Parachutes." One line of the song advised, "If you have a daughter, teach her how to fly." One of the members of this organization asserted that "...we have taught our daughters how to fly, both in the literal and in the figurative sense, and they are flying higher than we ever could. Our granddaughters and our great-granddaughters, I can only assume, will fly ever higher - perhaps they will even reach the stars!" (Cole, 1992, p. 155). It is time for women to "fly ever higher" in all areas of aviation and aviation education and our colleges and universities are in the perfect position to do this.

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APPENDIXES

APPENDIX A

STRUCTURED TELEPHONE INTERVIEW

WOMEN FACULTY IN COLLEGIATE AVIATION EDUCATION

NAME OF INSTITUTION: ______________________________________

ADDRESS: ____

CONTACT PERSON: ___________________________ TITLE: _________

PHONE: _______________ DATE: __________ TIME: _____________

[Pre-Announcement: Interviewer]

"Hello, my name is ____________ and I'm calling from Wichita State University. I am conducting research for a doctoral dissertation by surveying all 4-year aviation-degree-programs in universities that are members of the UAA. Your opinions are very valuable in making this study a success and I would appreciate the use of 10-15 minutes of your time to draw on your expertise in aviation education. [Pause for response.] Your answers to the following questions will be confidential. The results will be reported in a summarized, aggregated format, without any individual persons or institutions being identified."

1. What is your job title? ______________________________________

   ____

2. [Circle gender]: F M

3. Aviation programs often have unique names, (i.e. Division of Aviation Technology,) and are often housed in various departments, (for example: in the College of Engineering, School of Business, etc.) What is the name of your Aviation program and in what college, school, or division is it located?

____

A. What year was your aviation program established?________

4. At your institution, how many students are currently enrolled in aviation in each degree area?
AS____ BS/BA____ MASTERS____ DOCTORATE____
TOTAL_____

A. Within the next two years, does your institution plan to offer any higher level aviation degrees than presently offered? YES NO
If yes, what? BS/BA MBA MS Ed.D Ph.D Other____________

5. Would you characterize your aviation program as:
[ ] Growing [ ] Declining [ ] Remaining constant in student numbers?

A. (If growing,) by what percentage? ______%

B. To what factors do you attribute this situation/status?_______________

____

____

6. Do you have a minor in an aviation discipline? YES NO

7. Approximately what number or percent of students are female in your aviation-degree program? _____%

8. What majors are available in your Aviation-degree program(s)? (Check all that apply) **[Interviewer: Ask interviewee what majors are available; if none are listed below, write in Other space.]**

Aviation Management Program____
Flight Training____
Aircraft and Powerplant Training____
Avionics____
Airway Science:
Airway Science Management____
Airway Computer Science____
Aircraft Systems Management____
Airway Electronic Systems____
Aviation Maintenance Management____
Other____

9. Are the following available in your program?

YES NO

☐ ☐ Flight training aircraft; if so, how many owned?____leased?____
☐ ☐ Flight training simulators; if so, how many owned?___leased?___
☐ ☐ Certified Flight Instructors; if so, how many?____how many are female?_____
☐ ☐ Certified Ground Instructors; if so, how many?____how many are female?_____
☐ ☐ Do you have aviation scholarships; if so, how many?______ Are any of the scholarships exclusively for females? yes no if yes, how many?____

10. The following questions concern aviation faculty demographics at your university:

What is the:
Number of full-time aviation faculty?______
Number of female aviation faculty?________
Number of aviation faculty with a baccalaureate degree?______
Number of aviation faculty with a masters' degree?_________
Number of aviation faculty with doctorate degrees?_________

[Interviewer: Skip questions 11-13 if there are no females on the faculty.]

11. What is the highest degree held by each of your full-time female aviation faculty?

_______ _______ _______ _______

_______ _______ _______ _______

12. What is the highest flight rating held by each of your full-time female aviation faculty?

_______ _______ _______ _______

_______ _______ _______ _______

13. Is the Aviation Director, aviation department chair, or faculty aviation coordinator a woman? YES NO
A. If yes, which one(s)?_______________________________

14. Do you feel women faculty and/or students are underrepresented in collegiate aviation education? YES NO

A. If yes, why do you think this? (Example: can't find women faculty who have both CFI and doctorate) _______________________________

____

Please indicate your level of agreement with each of the following statements by choosing a number from 1 to 7, with 1 being Strongly Disagree and 7 being Strongly Agree. There are no right or wrong answers; I am simply interested in your candid opinion. Feel free to expand on any question.
State: Strongly Agree 7 6 5 4 3 2 1 Strongly Disagree [ ] Don't know

15. The fact that 6% of U.S. certified pilots are female is a satisfactory number.
Strongly Agree 7 6 5 4 3 2 1 Strongly Disagree [ ] Don't know

16. In order to attract and retain female students in nontraditional professions, universities should provide child care.
Strongly Agree 7 6 5 4 3 2 1 Strongly Disagree [ ] Don't know

17. The FAA promotes the participation of females in collegiate aviation education.
Strongly Agree 7 6 5 4 3 2 1 Strongly Disagree [ ] Don't know

18. The University Aviation Association promotes the participation of females in collegiate aviation education.
Strongly Agree 7 6 5 4 3 2 1 Strongly Disagree [ ] Don't know

19. The FAA's Airway Science Program assists in recruiting female aviation students.
Strongly Agree 7 6 5 4 3 2 1 Strongly Disagree [ ] Don't know

20. There are barriers to female faculty in aviation education in general.
Strongly Agree 7 6 5 4 3 2 1 Strongly Disagree [ ] Don't know

If Agree:
A. **[For women]**: What barriers, if any, have you encountered?__________

____

[For men]: What barriers, if any, have you observed?__________________

____

****

[Interviewer: Question 21 should be asked of women only.]

21. How did you get into this profession?________________________________

____

____

A. Did you have a mentor? YES NO

B. Do you have suggestions for other women who want to become involved in collegiate aviation education?__________________________

____

____

22. From your perspective, what is the most outstanding feature of your aviation program?____

____

From the students' perspective, what is the most outstanding feature of your aviation program?______________________________________

____

23. Will you be hiring any new faculty in the next 2 years? YES NO

24. What advice would you offer to universities to increase the participation of female faculty members in baccalaureate aviation education?____________

____

____

25. What do you consider to be your most effective marketing techniques in the recruitment of female students and/or faculty? ____________________

____

____

26. What do you think are the most critical issues facing aviation in higher education?

____

____

____

27. Do you have any final comments or recommendations which might be helpful in future research on women in the collegiate aviation education faculty?

____

____

____

____

[Post-Announcement: Interviewer]
That completes our survey, I appreciate your assistance. Do you have any questions or other comments for me? ______________________________

____

Once again, thank you for your time.

[If asked]
The results will be published in the National Institute for Aviation Research Monograph Series at Wichita State and other academic journals as accepted.

[If asked for a copy]
Would you like to have a copy of the monograph series report when it is published? YES NO

Do you want us to mail you a complementary catalog of the NIAR Reports?
YES NO

If Yes: Interviewer, verify address.

____

If a respondent wants further information they should contact:

Jackie Luedtke
National Institute for Aviation Research
Wichita State University - Campus Box 93
Wichita, KS 67260
(316) 689-3678

Interviewer Signature__________________________ Date______________

Other Notes:____

____

____

APPENDIX B

FOUR-YEAR UNIVERSITY AVIATION ASSOCIATION MEMBER INSTITUTIONS
FEBRUARY 1993

Four-year UAA member institutions - February 1993	
Andrews University Berrien Springs, MI	Arizona State University Tempe, AZ
Auburn University Auburn, AL	Averett College Danville, VA
Bowling Green University Bowling Green, OH	Bridgewater State College Bridgewater, MA
California State University Los Angeles, CA	Central Missouri State University Warrensburg, MO
Central Washington University Ellensburg, WA	Chadron State College Chadron, NE
College of West Virginia Beckley, WV	Concordia University Wisconsin Mequon, WI
Daniel Webster College Nashua, NH	Delaware State College Dover, DE
Delta State University Cleveland, MS	Dowling College Oakdale, NY
Eastern Kentucky University Richmond, KY	Elizabeth City State University Elizabeth City, NC
Embry-Riddle Aeronautical University Daytona Beach, Fl	Fairmont State College Fairmont, WV
Florida Institute of Technology Melbourne, FL	Georgia State College Atlanta, GA
Golden Gate University San Francisco, CA	Hampton University Hampton, VA
Henderson State University Arkadelphia, AR	Indiana State University Terre Haute, IN
International American University of Puerto Rico Rio Piedras, Puerto Rico	Jackson State University Jackson, MS
Kent State University Kent, OH	Lewis University Romeoville, IL

Louisiana Tech University Ruston, LA	Lynn University Boca Raton, FL
Mankato State University Mankato, MN	Metropolitan State College of Denver Denver, CO
Middle Tennessee State University Murfreesboro, TN	Morris Brown College Atlanta, GA
National University San Diego, CA	Norfolk State University Norfolk, VA
Northeast Louisiana University Monroe, LA	Northern Michigan University Marquette, MI
Ohio State University Columbus, OH	Ohio University Athens, OH
Oklahoma State University Stillwater, OK	Parks College of St. Louis University Cahokia, IL
Purdue University West Lafayette, IN	Rocky Mountain College Billings, MT
San Jose State University San Jose, CA	Southeastern Oklahoma State Univ. Durant, OK
Southern Illinois University Carbondale, IL	St. Cloud State University St. Cloud, MN
St. Francis College Brooklyn Heights, NY	Suffolk University Boston, MA
Tennessee State University Nashville, TN	Trinity Western University Abbotsford, BC
University of the District of Columbia Washington, D.C.	University of Maryland Eastern Shore Princess Anne, MD
University of Nebraska-Kearney Kearney, NE	University of Nebraska-Omaha Omaha, NE
University of New Haven West Haven, CT	University of North Dakota Grand Forks, ND
University of Oklahoma Norman, OK	University of Southern California Los Angeles, CA
Utah State University Logan, UT	Western Michigan University Kalamazoo, MI
Wichita State University Wichita, KS	Wilmington College New Castle, DE
Winona State College Winona, MN	

VITA

Jacqueline R. Luedtke

Candidate for the Degree of

Doctor of Education

Thesis: MAXIMIZING PARTICIPATION OF WOMEN IN COLLEGIATE AVIATION EDUCATION

Major Field: Higher Education

Area of Specialization: Aviation Education

Biographical:

Personal Data: Born in Emporia, Kansas, February 16, 1953, the daughter of Naomi and Robert Maxwell. Married December 26, 1971, to Marc H. Luedtke.

Education: Graduated from Southeast High School, Wichita, Kansas, in May, 1971; received Associate Degree in Natural Sciences and Mathematics and Bachelor of Business Administration in Marketing from Wichita State University in May, 1989; received Master of Business Administration degree in Aviation Management from Wichita State University in May, 1991; completed requirements for the Doctor of Education degree at Oklahoma State University in July, 1993.

Professional Experience: Business Manager, National Institute for Aviation Research, Wichita State University, January, 1991 to present. Instructor, Aviation Management, W. Frank Barton School of Business, Wichita State University, June, 1991 to present.

Professional Organizations: Aircraft Owners and Pilots Association, Alpha Eta Rho, American Association of Airport Executives, American Marketing Association, Civil Air Patrol, Ninety-Nines, Pi Sigma Epsilon, University Aviation Association, Kansas Aviation Museum, and Wichita State University Flying Club Board of Directors.

FAA Ratings: Private Pilot, Airplane Single Engine Land and Instrument, Advanced-Instrument Ground Instructor, FAA Designated Examiner.